DEVICE FOR PRODUCING PLASTIC PIPES

The invention relates to a device for producing plastic pipes according to the precharacterizing clause of the main claim.

In equipment that produces plastic pipes, there exists the problem that pipes of different outside diameters must be produced with, at the same time, different wall thicknesses. In the prior art in this regard it is necessary that, corresponding to the outside diameter of the pipe and to the desired wall thickness (usually normalized in dependence on the outside diameter) of the pipe, appropriate tools be interchanged. This causes a stopping of the machine, a high labor expense for the exchanging of the tools, and a loss of plastic material, until the new pipe can be again drawn. An appropriate drawing of the pipe that allows the production of a pipe of less wall thickness, with an existing outside diameter, is for this reason impossible, since the molecular chain of the plastic material is stretched and also orientated in such a manner that thereby the strength of the pipe is negatively influenced, and the formation of shrinkings and foldings is fostered.

Known from the class-forming DE 24 12 818 is a device for calibrating a pipe of thermoplastic plastic material emerging from an extruder press; in this known arrangement, viewed in the production direction of the pipe, calibrating lamellae are arranged in sequence. Each calibrating lamella displays a calibrating passage, which for all the sequential calibrating lamellae is alike and unchangeable. Each calibrating lamella works together with a lamellae segment that can be lifted off upwardly, which during the startup phase of the production can be lifted off, so that the placing of the pipe leaving the extruder or the pipe head into the calibrating passage is facilitated. A variation of the pipe diameter during the production process is not possible here and is not suggested.

From DE 35 21 321 has become known the method of making provision in a calibrating station for metal bellows, which through stretching or compressing can be varied in their inner diameter. Through this means, the changing outside diameter occurring upon the cooling down and contraction of the plastic material should be matched, in order to thereby make possible even during the cooling phase and the possibly decreasing outside diameter of the pipe, a good introduction of the pipe into the calibrating station.

Finally, from WO 95/27601 has become know the method, in a non-generic production process for plastic pipes, of making provision, in the interior of the pipe to be formed, for shaping tools that are formed through individual rollers; in this arrangement, through a greater or lesser widening of

the circumferential circle conditioned by the shaping tools, the pipe diameter can be changed. However, here the pipe is to be formed through a plate that is wound around this shaping tool, the end edges of the plates being welded to each other. Special pressure rollers act upon the weld seam produced in the joining of the two plates in such a manner that from outside inward this weld seam is to be no longer recognizable.

WO R2

The object of the invention is to create a device in order to achieve during the production phase of the pipe, without interruption of the production process, a fully automatically controlled resetting between several plastic pipe dimensions in the continuous extrusion process, the outside diameter and the pipe wall thickness being adjusted according to customer desires or to standardization, as the case may be.

This object of the invention is attained through the teaching of the main claim.

Advantageous configurations are explained in the dependent claims.

The possibly already pre-dimensioned mass extrusion can, according to the invention, enter into a calibrating station, in which different pipe dimensions can be set. To be sure, known from WO 96/36 457 is the method of carrying out minor calibration adjustments in a calibrating station by the fact that through a wedging effect, individual open calibrating rings can be slightly changed in their diameter. With such an arrangement, however, a variation of the pipe outside dimension is not achievable, but rather it is merely counteracted by the contraction behavior.

The calibrating station designed according to the invention is preferably formed through a multiplicity of lamellae, which are arranged so as to be spaced apart on the outside of the pipe to be calibrated, over the circumference of the latter, forming in each case a ring of lamellae. In this, seen in the production direction of the pipe is arranged inside the calibrating station a multiplicity of such lamella rings, the individual lamellae of the individual lamella rings being situated at the gaps with respect to each other, so that a problem-free adjustment of the individual lamellae of the individual ring with respect to the lamellae of the following ring or of the preceding ring is possible.

The adjustment of the lamellae takes place via a motor or by hand; through hand control, all of the lamella rings can be adjusted at the same time.

The rounding of the lamellae, with which the latter rests against the outside of the pipes, can correspond to the largest pipe diameter to be passed. If smaller diameters are passed, then the

treated pipe is not ideally round, but rather is composed of smaller, adjoining roundings, which are then equalized inside the calibration bath.

Instead of the above-described lamellae, provision can also be made for adjusting segments, which produce, viewed in the longitudinal direction of the pipe, pipe-shaped bodies, the individual segment strips forming these bodies engaging each other in a meshing manner, so that even in the case of adjustments to a larger diameter, still always regions of these segments rest on the pipe.

It is also possible to design the calibrating tools as rollers that rest on the outer side of the pipe, which rollers, controlled through springs or levers, define a pipe outer circumference that corresponds to the desired pipe dimension.

In the following, an example of embodiment of the invention is described with the aid of the drawings. They show:

Fig. 1: an overall view of a production device

Fig. 2: seen in the production direction, a section through a calibrating head

Fig. 3: in the section according to line 3 – 3 in Fig. 2, the sequentially arranged lamella rings

Fig. 4: a modified example of embodiment

Recognizable in Fig.1 is an adjustable pipe head, which, seen in the production direction, adjoins an extruder (not represented in the drawing). Connected to the adjustable pipe head 1 is a vacuum suction lock 2, which is equipped with a vacuum suction connection 5, in which provision is made for measuring devices that, depending on the desired pipe outside diameter, set the vacuum prevailing in the suction lock, so that thereby the pipe-shaped stream of molten material is adjusted to the desired outside diameter, i.e. is sucked up; in this, a pre-cooling of the molten extrusion can already take place in the vacuum suction lock 2. In the vacuum suction lock 2, in conjunction with the adjustable pipe head an exact pipe wall thickness can be set; the pipe wall thickness can be varied depending on the outside diameter of the pipe.

Connected to the vacuum suction lock 2 is a calibrating station 3. Here, through a mechanical central adjustment, takes place the exact calibration of the outside diameter of the extrusion of

molten material and of the already partially-hardened pipe, this calibration being applicable to all plastics that come into consideration. In this calibration station, several dimensions can be adjusted even with the different wall thicknesses.

In a vacuum calibrating bath 4 connected with this, seen in the production direction, the cooling down and hardening of the plastic pipe then takes place through water spray, a water feed 6 and a water outlet 7 being recognizable in the drawing. Further, joined to the vacuum calibrating bath 4 is a vacuum connection 8, and the pipe 10 located in the vacuum calibrating bath 4 passes over support rollers 11, which can also be called the calibrating rollers and can be set to the desired pipe diameter. The surface of the pipe 10 is relatively hard, and the pipe 10 leaves the vacuum calibrating bath 4 through a vacuum seal 9, which either adjusts automatically to the pipe diameter or is adjusted depending on the pipe dimensions set in the calibrating station 3 and/or in the vacuum calibrating bath 4. In the vacuum seal 9 can be arranged formed rollers, which are actuated hydraulically or through mechanical springs; here, at the same time, water for lubrication and sealing can be introduced into the path of the pipe.

Figs. 2 and 3 show sections through an embodiment form of the calibrating station 3. It can be seen that inside the outer wall 44 of the calibrating station are arranged a number of lamellae 40, which, distributed over the circumference of the pipe 10, rest against the outside wall of the pipe 10. The contacting edge 41 of each lamella 40 displays here a rounding, which corresponds to the largest possible outside diameter of the pipe 10. It is recognizable from Figs. 2 and 3 that a multiplicity of lamella rings 42 and 43 are arranged sequentially, as viewed in the production direction of the pipe. In the case of the representation in Fig. 3, forty-five lamella rings are arranged, and according to Fig. 2 each lamella ring 42 or 43 is formed by six lamellae 40; however, the invention is in no way limited to this.

In the embodiment form according to Fig. 2, provision is made for adjusting motors 45, which, controlled in common, effect a common adjustment of all of the lamella rings; here, the adjustment of the adjusting motors 45 can take place in a centrally controlled manner with the corresponding control in the suction group 2 and the calibrating bath 4.

Fig. 4 shows an embodiment form in which a number of individual rollers 50 rest on the outside wall of the pipe to be produced, the rollers being borne by levers 51, which are movable by means of positioning devices, so that thereby the desired inside diameter of the circle of rollers can be set. The positioning devices 52 and the levers 51 are arranged on a positioning wheel 53, which can be moved in a circular manner by means of a motorized device.